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A SERIOUS EELWORM OR NEMATODE DISEASE OF WHEAT

Control the Disease by

Use of clean seed—Crop rotation—Sanitary measures

A Good Head of Wheat between Two Diseased Heads

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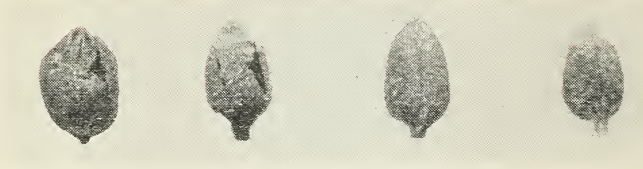
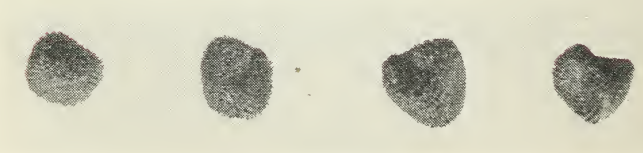
Sound Wheat Kernels



Smutted or Bunted Grains

Bin-Burnt Kernels

Eelworm or Nematode Galls of Wheat



Cockle Seed

COMPARE the sound wheat with the eelworm-containing galls and note the difference between these galls and the seed of cockle, the smutted wheat grains, and the bin-burnt kernels. Photographed about three times natural size.

Within a short time a more complete and technical publication on the nematode disease entitled "A Disease of Wheat in the United States Caused by the Nematode *Tylenchus tritici* and Its Control" will be available.

A SERIOUS EELWORM OR NEMATODE DISEASE OF WHEAT

A SERIOUS DISEASE OF WHEAT long known in Europe and caused by a nematode or eelworm[1] has been very recently found causing a great deal of damage in certain parts of the United States, particularly in Virginia.

DESCRIPTION

The disease is usually noticed by its effects on wheat heads in the field, although it may occur on all parts of the plant above ground. Diseased heads ordinarily stay green longer—that is, ripen later—and are smaller than those not affected, and the chaff is apt to open out at a wider angle than that of the good heads. In place of the expected good grains of wheat the head bears dark, hard galls shorter and somewhat thicker than wheat grains, and, since the chaff spreads open, these can often be plainly seen in the affected spikelets before thrashing. As these galls bear a resemblance to cockle, the seed of a common grainfield weed, farmers have mistakenly applied the name "cockle" to these galls, and "cockle wheat" is a common term for this disease in the thrashed grain. Sometimes it has been mistaken for bunt, or stinking smut, a disease caused by a fungus related to the common loose smuts of corn and small grains. It has also been confused with bin-burnt wheat, caused by overheating in storage. A careful examination of these different troubles will show that this nematode disease is entirely distinct from them.

CAUSE

Within these wheat galls are thousands of living but motionless young nematodes called larvæ, which can be barely seen as short, threadlike fibers when placed in water. In the spring these young eelworms or larvæ escape into the soil from galls which have fallen to the ground or which were planted along with the wheat seed. With an eel-like movement they reach the young seedlings, finally become located between the leaf sheaths near the bud, and as the plant grows are

[1] *Tylenchus tritici* (Steinbuch) Bastian is the scientific name of the nematode causing the disease.

gradually carried up to the heads. There they enter the young flowers and produce the galls, within which they reach maturity, lay eggs, and again give rise to larvæ, and in this way complete their life cycle. At maturity of the plant the larvæ become dried out and motionless, in which condition they can remain alive for many years.

DISTRIBUTION AND IMPORTANCE

The disease was first reported to occur to a slight extent in 1909 in California, New York, West Virginia, and Georgia. After that time nothing is known about the occurrence of the trouble until 1917, when it was located at one place in Virginia, and since then it has been found at many points in the same State and in one locality in California. Samples of wheat mixed with the nematode galls collected at Virginia mills last winter indicate that the disease caused a damage of more than 25 per cent in some fields last season. Recent examination of the 1918 crop shows as much as a 40 per cent loss in certain fields in Virginia.

Although the present known distribution of the trouble is confined to California and Virginia, it seems highly probable that it has been spread to other wheat-growing regions along with importations of seed from foreign countries, in many of which the disease is widespread. Very likely the trouble occurs even to a considerable extent in many States and has been merely overlooked or has been mistaken for bunt, cockle seed, or bin-burnt wheat. An examination of wheat before or after thrashing should yield valuable information on this point. Samples of wheat or grain thought to be affected with this disease should be sent for positive identification to the State Agricultural Experiment Station or to the Office of Cereal Investigations, U. S. Department of Agriculture, Washington, D. C.

CONTROL

As the disease is not native to the United States, every effort should be made to prevent its further spread within this country, to stamp it out in localities already infested, and to stop its further introduction from foreign countries. It may be controlled by the measures suggested below.

USE OF DISEASE-FREE SEED

Secure clean, sound seed from fields in which the disease does not occur and therefore seed unmixed with the nematode galls.

If this can not be done, the galls may be separated from the wheat kernels by the following method: Pour slowly the mixture of seed

and galls into a suitable receptable containing water, and at the same time stir vigorously. Being lighter than the wheat kernels and the water, the nematode galls will quickly rise to the surface, where they can be skimmed off. Unless the mixture after being placed in water is roiled by vigorous stirring or otherwise, some of the galls will be held below the surface, along with the seed, and should the immersion last too long (more than 10 or 15 minutes) many of the galls will become soaked with water and sink. After the galls are skimmed off, the remaining clean seed should be spread out to dry thoroughly before being sown.

Should difficulties arise in preventing the separation of galls from the seed grains, the contaminated seed can be freed of all living nematodes by placing it in water heated to a temperature of 54° to 56° C. (129° to 132° F.) for 10 or 20 minutes, a treatment which is also effective against smut.

CROP ROTATION

Land on which nematode-infected wheat has been grown should be planted to other crops for two, or, better still, three years. During this time the nematode will be so starved out that a subsequent wheat crop grown from clean seed will be free from the trouble, or practically so. Any crop may be used in the rotation, since only wheat is known to be seriously attacked by the disease.

SANITATION

Care should be taken to prevent the spread of the nematode from one field to another by means of infested soil which may cling to the feet of men or animals or to various kinds of farm implements. Surface waters, which may carry galls or the free larvæ, should not be permitted to pass from infested soils to uninfested areas. A deep plowing under of the stubble just after harvest lessens the spread of the disease either to near-by fields or within the same field.

L. P. Byars.

THE PRESIDENT TO THE FARMERS OF AMERICA

[Extracts from President Wilson's message to the Farmers' Conference at Urbana, Ill., January 31, 1918.]

"The forces that fight for freedom, the freedom of men all over the world as well as our own, depend upon us in an extraordinary and unexpected degree for sustenance, for the supply of the materials by which men are to live and to fight, and it will be our glory when the war is over that we have supplied those materials and supplied them abundantly, and it will be all the more glory because in supplying them we have made our supreme effort and sacrifice.

"In the field of agriculture we have agencies and instrumentalities, fortunately, such as no other government in the world can show. The Department of Agriculture is undoubtedly the greatest practical and scientific agricultural organization in the world. Its total annual budget of $46,000,000 has been increased during the last four years more than 72 per cent. It has a staff of 18,000, including a large number of highly trained experts, and alongside of it stand the unique land-grant colleges, which are without example elsewhere, and the 69 State and Federal experiment stations. These colleges and experiment stations have a total endowment of plant and equipment of $172,000,000 and an income of more than $35,000,000, with 10,271 teachers, a resident student body of 125,000, and a vast additional number receiving instruction at their homes. County agents, joint officers of the Department of Agriculture and of the colleges, are everywhere cooperating with the farmers and assisting them. The number of extension workers under the Smith-Lever Act and under the recent emergency legislation has grown to 5,500 men and women working regularly in the various communities and taking to the farmer the latest scientific and practical information. Alongside these great public agencies stand the very effective voluntary organizations among the farmers themselves which are more and more learning the best methods of cooperation and the best methods of putting to practical use the assistance derived from governmental sources. The banking legislation of the last two or three years has given the farmers access to the great lendable capital of the country, and it has become the duty both of the men in charge of the Federal-reserve banking system and of the farm-loan banking system to see to it that the farmers obtain the credit, both short term and long term, to which they are entitled not only, but which it is imperatively necessary should be extended to them if the present tasks of the country are to be adequately performed. Both by direct purchase of nitrates and by the establishment of plants to produce nitrates, the Government is doing its utmost to assist in the problem of fertilization. The Department of Agriculture and other agencies are actively assisting the farmers to locate, safeguard, and secure at cost an adequate supply of sound seed."

"The farmers of this country are as efficient as any other farmers in the world. They do not produce more per acre than the farmers in Europe. It is not necessary that they should do so. It would perhaps be bad economy for them to attempt it. But they do produce by two to three or four times more per man, per unit of labor and capital, than the farmers of any European country. They are more alert and use more labor-saving devices than any other farmers in the world. And their response to the demands of the present emergency has been in every way remarkable. Last spring [1917] their planting exceeded by

12,000,000 acres the largest planting of any previous year, and the yields from the crops were record-breaking yields. In the fall of 1917 a wheat acreage of 42,170,000 was planted, which was 1,000,000 larger than for any preceding year 3,000,000 greater than the next largest, and 7,000,000 greater than the preceding five-year average.

"But I ought to say to you that it is not only necessary that these achievements should be repeated, but that they should be exceeded. I know what this advice involves. It involves not only labor but sacrifice, the painstaking application of every bit of scientific knowledge and every tested practice that is available. It means the utmost economy, even to the point where the pinch comes. It means the kind of concentration and self-sacrifice which is involved in the field of battle itself, where the object always looms greater than the individual. And yet the Government will help and help in every way that is possible."

"It was farmers from whom came the first shots at Lexington, that set aflame the Revolution that made America free. I hope and believe that the farmers of America will willingly and conspicuously stand by to win this war also. The toil, the intelligence, the energy, the foresight, the self-sacrifice, and devotion of the farmers of America will, I believe, bring to a triumphant conclusion this great last war for the emancipation of men from the control of arbitrary government and the selfishness of class legislation and control, and then, when the end has come, we may look each other in the face and be glad that we are Americans and have had the privilege to play such a part."